Engineering Heritage Australia

Newsletter of the National Committee on Engineering Heritage
The Institution of Engineers, Australia

No. 6 September 1996

EDITORIAL
Recognition of Engineering Heritage

At last engineering heritage is achieving some official recognition, if the article on this page concerning the Victoria Heritage Act, and the South Australian listings elsewhere in this Newsletter, are some indication. However, much more needs to be done.

The Insitution has for some years been expressing concern that Governments and statutory heritage bodies have a preoccupation with buildings, to the detriment of the large body of other important heritage items. It is also of concern that many heritage bodies lack members with the knowledge and skills to effectively consider engineering heritage matters.

This not only sends the wrong message about the nature of heritage to the community, but encourages an excessive bias towards buildings in the allocation of both human and financial resources, with consequent inadequate attention to our rich engineering and industrial heritage. Yet works such as roads, bridges, railways, water supply, sewerage maintenance structures, machinery, industrial and mining operations, are the basic infrastructure of our society, and have been the means of development of our civilised community.

A much greater representation is needed of engineering items in official listings and it is imperative that the membership of heritage bodies include engineering representatives with a practitioner background. This should help ensure a better understanding of engineering values, a more equitable allocation of resources, and increased attention to the conservation of these vulnerable utilitarian works.

This Newsletter is published by the National Committee on Engineering Heritage of The Institution of Engineers, Australia.

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Victoria Heritage Act 1995

The new Heritage Act was proclaimed by the Governor on 23 May 1996. The new Heritage Act broadens the types of heritage places which can be protected in Victoria. For the first time a broad range of significant heritage places including buildings, historical archaeology sites, precincts, gardens, trees, cemeteries, shipwrecks and objects will all be protected by one piece of legislation.

The Heritage Act 1995 repeals the Historic Building Act 1981 and the Historic Shipwreck Act 1981 and replaces them with a single updated Act which also deals with non-Aboriginal archaeological sites, previously covered under the Archaeological and Aboriginal Relics Preservation Act 1972.

The Act covers the appointment of the Heritage Council which consists of ten members appointed by the Governor in Council on the recommendation of the Minister. The members include six people who must possess recognised skills in one of each of the following areas: history, architectural conservation or architectural history, archaeology, engineering or building construction, property management and planning law. One must be appointed on the nomination of the Minister from a list of three submitted by the National Trust of Australia (Victoria) and three are appointed by the Minister who have a demonstrated understanding, expertise or interest in Victoria's heritage or the management of heritage places.

- Reduced from Article in ASHA

Port Stephens Takes a Punt

The 50-year-old vehicular ferry at Bombah Point in New South Wales has been taken out of service, and will be replaced with a new vessel by October this year. The punt crossed the Myall Lakes on the road between Bulahdelah and Hawks Nest, north of Newcastle.

The ferry was built in 1946 for the Shire of Stroud and originally linked the twin towns of Hawks Nest and Tea Gardens, near the mouth of the Myall River. When the two towns were joined by bridge in 1974, the vessel was towed upstream to Bombah, where it has provided a half-hourly daylight service ever since.

The punt was a timber-hulled pontoon vessel, 15.2m long overall and 7.7m beam. The hull structure consisted of a series of longitudinal frames in the form of timber trusses, about 1425mm deep and generally about 775mm apart. The trusses had 150mm wide upper and lower chords, and alternating vertical and 45° web members; the direction of the inclined web members reversed from truss to truss, so that alternate trusses had either Pratt or Howe configurations. Two sets of bracing provided transverse rigidity. All structural timber was local hardwood.

The bottom and sides of the vessel were clad in 200 x 62mm Douglas fir planks, laid in single pieces across the width. The deck was of 150 x 75mm planks, laid at 75° to the longitudinal axis. All planks were caulked, and the bottom and sides of the hull were sheathed in tarred felt and 16 oz copper.

The punt was powered by a two-cylinder Lister diesel, driving through a fluid coupling, belt drive and reversing gearbox to a final pinion and spur-wheel mounted on the main drive shaft, which carried a 1300mm diameter wheel engaging the 22mm traction rope across the waterway.

The hull will be towed back down the Myall River, and will end her days as a pontoon for oyster farming in Port Stephens.

National President Visits Heritage Sites

During his visit to Sydney Division on 16 July, the Institution's President, Dr Tom Connor and his wife Jan, found time to explore some of Sydney's engineering heritage.

With Sydney Division President, Elizabeth Taylor, and Heritage Committee Chair, Michael Clarke as guide, Dr and Mrs Connor (who are Brisbane based) visited a number of significant sites. These included the Argyle Cut, the memorial to Colonial Engineer George Barney, Cadman's Cottage, Sydney Cove and Circular Quay, the Opera House, First Government House site, Macquarie Place, Lands Department and the General Post Office.

Visting the George Barney Memorial

Other recent walks were conducted for 19 of the *Young Engineers Sydney* group on 10 August and for 22 people during National Engineering Week on 7 September. The Engineering Week bookings were so heavy that another walk was held the following Saturday.
These bring to 18, the engineering heritage walks conducted by the Sydney Engineering Heritage Committee, involving a total of 350 people. The walks are based on the walking guide *Sydney's Engineering Heritage - Walks in the City.* The booklet won for the Sydney Engineering Heritage Committee, the Tourism and Leisure Category of the Sydney Electricity and National Trust Heritage Awards in 1995.

Typical comment about the walks: "I've been walking around this city for 40 years and today I've heard things and have seen things I didn't know existed!"

The booklet is available from Sydney Division office (02) 9929 8544 at $6 including postage.

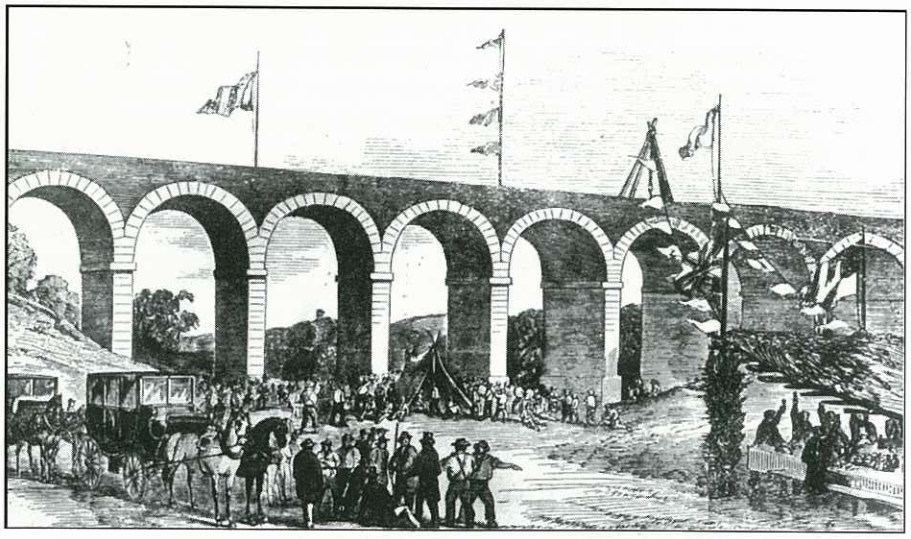
Historic Engineering Masonry

One hundred years ago, the major engineering materials - virtually the *only* engineering materials - were iron, timber and masonry. Steel and timber were transportable, but stone and brickwork were massive materials, and their transportation over primitive roads by horse-drawn vehicles presented huge problems. When planning any major works, it was important to select a construction site and a quarry (for stone) or a brickpit (for bricks) that were proximate. Up to about 1870, brickworks were usually simple affairs, often consisting of small kilns served by three or four brickmakers who shaped the bricks by hand; a brickworks could be established to facilitate a single construction site, and could as readily be abandoned once the need for its output no longer existed.

When work commenced on the Sydney to Parramatta railway in 1851, it was recognised by the contractor, William Randle, that with a dozen major bridges and several scores of culverts to be constructed, a number of brickyards would be required along the length of the line. These he established, at Newtown, Annandale, Ashfield, Duck River and other sites. The largest single structure on this line (in fact, the largest civil engineering work in the colony at that time) was the viaduct over the valley of Long Cove Creek, near Summer Hill; eight spans of 30 feet (9m), with piers up to 70 feet (21m) high. By July 1854, a quarter of a million bricks from Ashfield and surrounding areas were "on the ground" at Long Cove, and the viaduct was completed by the following March.

The brickworks of the Ashfield district are the subject of a book recently published - "Working the Clays", by Nora Peek and Chris Pratten - and Long Cove is one of the stories told in it. Both authors are Ashfield residents with a detailed knowledge of their study area; Peek is Principal Research Officer of the Ashfield and District Historical Society, whilst Pratten is a heritage consultant and former National Trust Director of Environment. The work is characterised by the detail of the research and the profusion of the illustrations; there are more than 150 of them, ranging through photographs, newspaper clippings, advertisements, site plans and sketches, including some delightfully clear diagrams by architectural historian Robert Irving. There are also some immensely useful photographs of early brickmakers' marks - would that every maker had identified his bricks with a mark and that every author included illustrations such as these!

The history of brickmaking in New South Wales is but poorly covered in heritage literature, and this book makes a worthy contribution. "Working the Clays" is available from the publishers, Ashfield and District Historical Society, at PO Box 20, Ashfield NSW 2131.



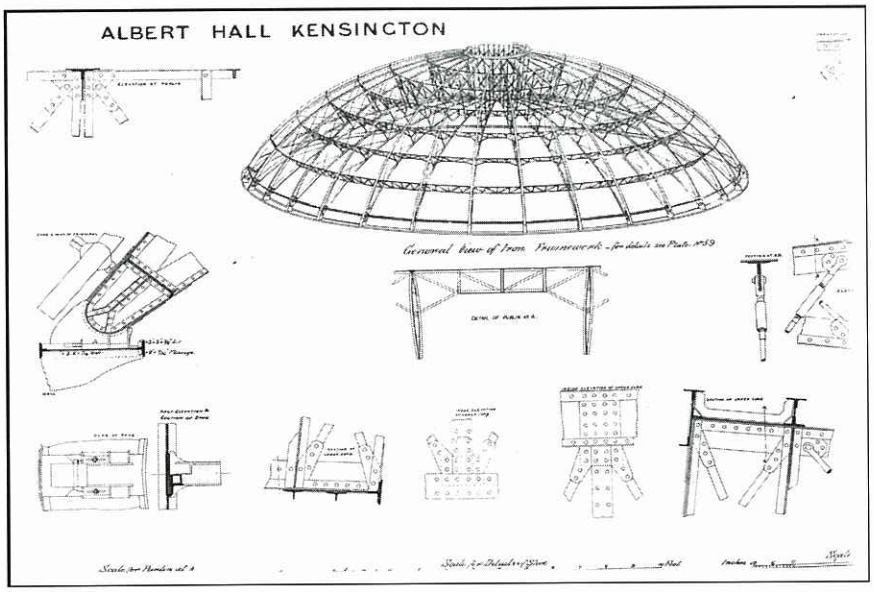
Laying the keystones of the Long Cove Viaduct.
(Illustrated Sydney News 24/03/1855)

The Telford Premium

In 1888 the second edition of the book "IRON ROOFS" was published. A copy of this book, showing examples of roof design and description illustrated with working drawings, was awarded by The Institution of Civil Engineers to Engineer Alfred Barton Brady for his design of the Lamington Bridge over the Mary River, Maryborough. The book was awarded to Brady as the Telford Premium in the 1899 - 1900 Session.

The book has had an unusual career path as when Architect's Stewart Thorpe and Robin Dods bought the practice of Lange L Powell in 1938 "This book was on the shelf and has been so ever since". On 8 October 1986 the practice of Lange L Powell, Dods and Thorpe donated the book to The Institution's Queensland Division.

Recently, funding was provided by the Queensland Division to conserve the book and to provide an archival box for its safekeeping. The book will form part of a proposed heritage library in the Divisional office.



The Australian Heritage Commission and The National Committee on Engineering Heritage

As a new initiative Wendy McCarthy AO, Chair of the AHC, has formed a Reference Group on the Historic Environment.

Members of this Group include the Presidents of the Royal Australian Institute of Architects, The National Trust, the Building Owners and Managers Association, Australia ICOMOS, and senior representatives from the Department of Communications and the Arts, and key staff from the AHC.

The Institution of Engineers, Australia is represented through our Committee by Paul Hagenbach.

This Reference Group should have considerable influence on the progression and acceleration of many national initiatives, and will continue to identify key issues, and future directions in the historic environment.

There is a three year strategic plan in place for National Heritage Co-ordination, it being a major commitment by Commonwealth and State/Territory Heritage Ministers to implement schedule 7 of the Inter-governmental Agreement on the Environment and to provide a more efficient and effective system of heritage administration in Australia.

The AHC will provide national leadership to establish a conceptual framework for the identification and protection of places of national significance, and develop and commence an action plan for their identification and promotion.

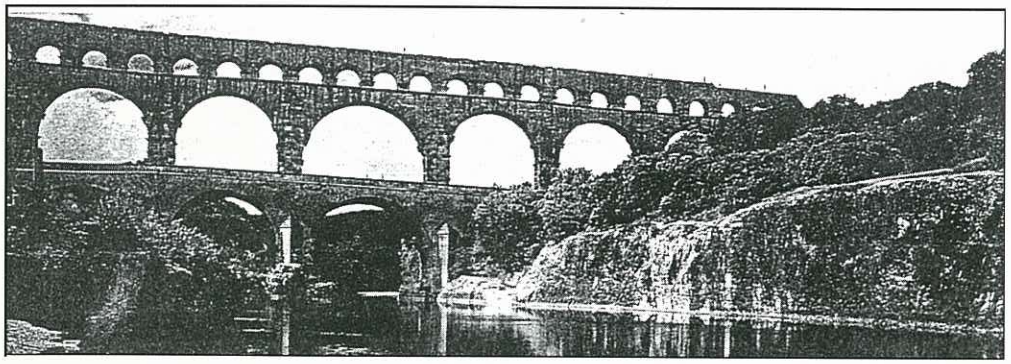
Public access to the Register of the National Estate data base will be provided through Internet. The data bases of the AHC, the States and the Territories must now be linked.

A coherent national policy on cultural and natural heritage identification and protection will be developed.

The AHC will lead the way in lifting the profile of cultural heritage among policy makers, the media and the general community.

There are many more initiatives that the AHC is actively working towards, and some of these will be mentioned in our next newsletter.

Roman Rushed Job a Magnificent Accident



From a pebble beach beside the Gardon River in the south of France, you stand to admire the Pont du Gard, one of history's grandest architectural changes: a partly pre-fabricated utilitarian structure, built in haste to carry water from the Eure spring to Nimes. A magnificent accident.

Two thousand years ago, Nimes was an important Roman settlement in this arid land. An engineer whose name was not recorded was ordered to secure the city's water supply and built a canal from Eure, 20 kilometres north of Nimes. His aqueduct, almost 50 kilometres long, serpentines across the undulating terrain, drives through mountains and soars splendidly 50 metres high across the sometimes tumultuous Gardon River on the Pont du Gard, the Roman empire's tallest known bridge-aqueduct.

The engineering achievement was stupendous. The fall in altitude from Eure to Nimes is just 17 metres, or 34 centimetres per kilometre of canal. But for its first 20-odd kilometres the canal plummets, at about 67 centimetres per kilometre, to reach the Gardon at aqueduct height. From there to Nimes the fall is no more than 18 centimetres per kilometre and as little as seven: a project that would test even our space-age measuring devices.

To build this vast waterworks, the engineer had simple measuring instruments, hand tools for tunnelling and shaping stone, and a few man-powered aids to lift the massive blocks. His best means of spanning space was the arch. His only available material was coarse local limestone. No roaring diesel cranes, no pre-stressed concrete, no steel scaffolding.

Fortunately for visitors in the next 2000 years - few would visit the Gardon were it not for the aqueduct - he had the injunction of the Roman engineer Vitruvius... "to achieve beauty in a structure, its shape must be pleasing and elegant through the correct proportions of all its parts ".

Did the engineer set out to build a masterpiece? Almost certainly not. The evidence is in the structure itself: the rough-finished stone surfaces, the unequal width of arches in the bottom two tiers (caused by the position of foundation rock) and masons' marks carved in the blocks, many of which were shaped at the nearby quarry and coded to indicate their position.

The soaring structure's proportions provide evidence of haste and economy: the Pont du Gard is more delicate-looking than most Roman bridge-aqueducts. This "lightness" created substantial savings in time and materials.

The splendour of the Pont du Gard is unlikely to have much moved those who relied on the water it provided for 800 years. For them, the miracle was not the aqueduct, in its far-away river valley, but the daily 20,000 cubic metres of fresh water - 400 litres for each of Nimes' 50,000 inhabitants - piped to more than 800 reservoirs and basins, 105 fountains and 170 public baths throughout the city.

After barbarian tribes drove the Romans out of Gaul, the channel fell into disuse. Locals plundered it for building materials, including the thick, easy-to-work calcareous deposits that had built up in it, like cholesterol in an artery. The Pont du Gard became a mere bridge, a short-cut to Beaucaire or the Papal seat of Avignon. Its thoroughfare was widened by cutting into the bases of the second-tier pillars. Contemporary drawings indicate that this hacking went dangerously close to bringing it down. So the aqueduct endured, near collapse, for several centuries. Finally, Napoleon III, awestruck by the decaying masterpiece, ordered its restoration. The three-year project was finished in 1858. The soaring structure, its honey-colored limestone glowing in the late afternoon sun, inspired Jean-Jacques Rousseau to exclaim: "The echo of my footsteps under these immense vaults made be believe I could hear the voices of those who had built them. I was lost, like an insect, in this immensity".

Near the tourist kiosk is an ancient olive tree, transplanted from Spain as a companion to the aqueduct. Gnarled, twisted and grey, the tree looks all of its estimated 700 years. Behind it, the Pont du Gard rears towards the heavens, ageless.

The viaduct is another example of engineering for the benefit of the community. We can be grateful to Napoleon for his conservation work on this 20BC masterwork of man and an important item in the world heritage list.

From "Business Review Weekly".

Let There be Light ! - Electrifying Sydney

The 1903 photograph shows the installation of cables in front of the Sydney Town Hall.

On 8 July 1904 the Lady Mayoress of Sydney switched on Sydney's electric street lighting system. It comprised 200 arc lamps using electricity from Pyrmont Power Station.

This of course was not the first public electric lighting in New South Wales. The first municipal-organised electric street lighting was switched on in Tamworth in 1888, and in 1889 public lighting existed in Penrith, Redern and other areas outside the City.

Sydney's first installed street lighting was by gas in 1841. This was comparatively early by world standards. Its electrical street lighting was authorised by the City Council following the passage of the Municipal Council Electrical Light Bill in 1896. The work was carried out by Henleys Telegraph Works Company Limited, London and supervised for them by Felix Kirk.

Kirk worked for Kabelwerk Duisburg for over five years, where he had been in charge of all its testing work and later, of the tramways in Brussels and Leipzig. Afterwards he was responsible for the contract to install the electric system for lighting and tramways in Wiesbaden.

He then became Head Engineer and in 1898 was also made Works Manager with sole control of all manufacturing, and responsibility for electrical contracts in places such as Germany, Russia, Romania and Austria.

Upon resigning from Kabelwerk Duisburg, Kirk joined Henleys. He was given charge of the electric lighting of Ilford, Essex and subsequently became Head Engineer in charge of contracts. In 1903 the firm obtained on his estimates, the contract for the cabling for the electric lighting of Sydney. The work was considered so important that Kirk was asked to go to Sydney as supervisor.

Felix Kirk's grandson Robert Kirk of Melbourne, has supplied a brief resume of Felix's career which forms the basis of the foregoing.

Turning on the Tap

On 20 April 1996 the Queensland Division Heritage Panel and the Brisbane History Group presented a seminar and tour of Brisbane's early waterworks with over 100 people attending.

John Laverty told of devious political manoeuvring which preceded the construction in the 1850s-60s of Brisbane's first dam on Enoggera Creek. Geoff Cossins spoke about Brisbane's second dam, constructed late last century on Gold Creek, which involved similar brickering, but this time between engineers about differing designs and construction methods.
Professor Ray Whitmore focussed on Engineer A B Brady, designer of the Enoggera Dam and ancillary waterworks. One of Brady's innovative design features was the location of the bypass pipe in a slot in the rock abutment (at the side of the dam) and not in the fill where it would be subject to failure through fill settlement.

Ian Cameron told of a hydrological re-assessment of the dam catchment, capacity and structure in 1972-3 which indicated that the dam was at risk of overtopping. The dam level was raised and in 1974 it escaped overtopping by a half metre.

David Morgans, an ecologist with Brisbane Forest Park, stressed the importance of these catchments as the only areas close to Brisbane where the original flora and fauna still existed relatively undisturbed.

Valve House - Enoggera Dam

Gold Creek Dam: An Engineering Heritage Landmark

Two Queensland university engineering staff members, Dr Chanson and Professor Whitmore, combined recently to investigate the Gold Creek dam and its spillway system. The study investigated both the engineering and heritage features of the dam.

The Gold Creek dam is a 19th century structure located on the outskirts of Brisbane, in the western suburb of Brookfield. It is the 14th largest dam built in Australia and is still in use. Built between 1882 and 1885, the dam is an earth embankment, 26m high. In 1890, a stepped spillway was built and it is still used today.

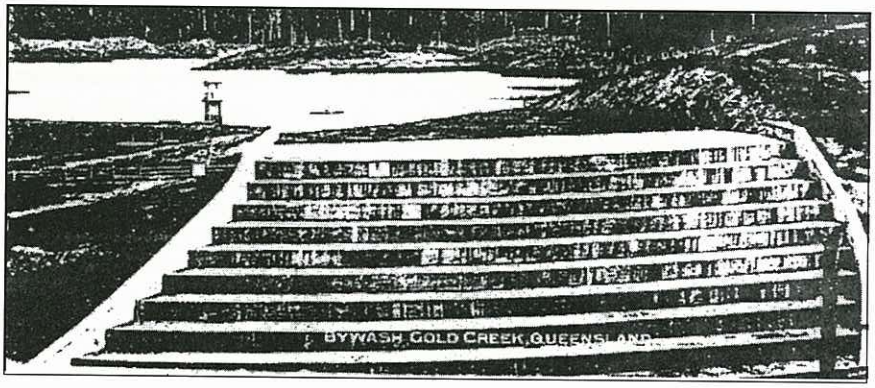
The stepped spillway of Gold Creek dam is an unique structure. It is the only stepped weir built in Queensland before 1900. The construction material (ie. concrete) is also unusual because, during the 19th century, most stepped channels were reinforced with ashlar and stone blocks rather than concrete to protect the step faces from erosion. The choice of concrete as the construction material for the spillway was not obvious at the time. However this proves also the foreknowledge of our 19th century predecessors.

The study shows that the Gold Creek dam spillway is an important heritage landmark in Australia. It includes unique features (large steps for energy dissipation, concrete construction). The spillway has operated safely and soundly for over a century, demonstrating the Australian engineering savoir-faire in dam and spillway engineering.

The results of the study is presented in the report:

CHANSON, H, and WHITMORE, R L (1996). "Investigation of the Gold Creek Dam Spillway, Australia".

Note that this report is available free of charge by writing to The Department Secretary, Department of Civil Engineering, The University of Queensland, Brisbane QLD 4072.



1890 photograph of the spillway

One Hundred Years of Radio

1996 is the centenary of the filing for a patent, for the first practical system of wireless telegraphy by the 20 year old Guglielmo Marconi. He was granted Patent No. 12029 for "Improvements in transmitting electrical impulses and signals and in apparatus therefore".

Today's offshoots including AM and FM radio, television, mobile phones and hosts of others, are all descendants of Marconi's basic technology.

Marconi became interested in the work of Heinrich Hertz who demonstrated the existence of electromagnetic waves, and began experimenting on his own. He assembled items of equipment including coherer, induction coil, spark gap and batteries and soon was able to signal across the room used as his laboratory.

On 20 July 1997, Marconi established The Wireless Telegraph and Signal Company Limited which two years later became Marconi's Wireless Telegraph Company Limited.

Ernest Fisk, one of Marconi's former employees 0established Amalgamated Wireless (Australasia) Limited in Sydney in 1913 and became Marconi's Australian representative. Fisk later was instrumental in establishing the Institution of Radio Engineers (Australia) and became its first Fellow.

Marconi never visited Australia, but on 26 March 1930 he pressed a telegraph key on the transmitter of his floating laboratory the Elettra in Genoa Harbour, causing an apparatus in Sydney to switch on a 3000 lamp display at the Electric and Radio Exhibition.

The Lions Club of Turin presented a bust of Marconi to the Lions Club of Sydney, to mark the Golden Jubilee of AWA Limited. It was unveiled at AWA's Ashfield site on 14 March 1964 and when AWA vacated the site in 1990, the bust was transferred to the care of OTC at La Perouse. The site is now the Telstra Maritime Communications Station, where the bust remains as a tribute to this great pioneer of communications engineering.

Contributed by Jack Ross of Port Macquarie. (Jack is writing a book on the History of Broadcast Engineering).

New Heritage Listings of Engineering Items

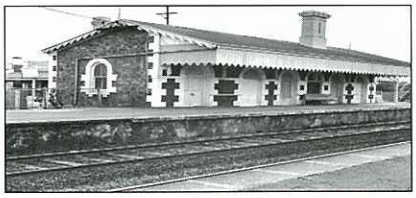
The following items of engineering heritage significance have been added to the South Australian State Heritage Register during the latter part of 1995:

- Bundaleer Reservoir Tower, Aquaducts , Three weirs, channel system and reservoir keepers house. Built in 1898 - 1902 the reservoir is located near the town of Gulnare.

Aqueduct Bundaleer Reservoir

- Duco Factory 67 Lipson Street, Port Adelaide. Built in 1939 specifically for the manufacture of automotive lacquers. The factory is associated with the increasing demands of South Australia's emerging motor vehicle industry.

- Alberton Railway Station. Built in 1856 it is one of the earliest stations still operating in the southern hemisphere.



Alberton Railway Station from East

- Southern Abutment of 1857 bridge, Old North Arm Road, Port Adelaide. Recently rediscovered these bridge timbers provide evidence of an early attempt to link the City of Adelaide with its preferred Port site.

- Threshing Floors near Pelican Lagoon, Iron Stone Hill and Cape Gantheame Conservation Park, Kangaroo Island. Dating from C1875 these rare floors were used for separating grain and employed horse drawn wooden roller rotating around a central pivot post.

- Eucalyptus Oil Distillery Ruins at Duck Lagoon and Cygnet River, Kangaroo Island. These distilleries were in use up to the late 1920's and are a valuable relic of a once common industrial activity.

- Fish Canning Site, Ballast Head, Kangaroo Island. Fish canning commenced in the 1890's. Now a fascinating industrial archaeological area it is a rare example of 19th century industry on the island.

- Lime Kiln Ruins, Bower (near Morgan). These kilns were established in the 1920's and business flourished into the 1930's. The relics are one of few survivors in South Australia.

- Depot Creek Weir and Reservoir, North-west of Quorn. Built in 1915 the reservoir served the railway to Alice Springs and the railway workshops at Port Augusta unit 1945.

- Davenport Reservoir and Storage Tank Stirling North - near Port Augusta. Built in 1894 to provide water supply to the town of Port Augusta.

- Water Tower - Mitchell Tce Port Augusta. This tank of boiler plate construction on 24 metre high tower was built in 1882. Now used as a "look out" it is a rare example of a large iron water tank.

- Wharf Port Augusta. Built from 1886 to 1916 with new decking in 1960. The wharf is significant by its size and scale which also reflects the early economic significance of Port Augusta.

NATIONAL COMMITTEE PLANS FOR THE FUTURE

On 17 August the National Committee on Engineering Heritage held a Strategic Planning Workshop to update its rolling Five Year Plan. The workshop included consideration of The Institution's policy on "Sustainability" in relation to engineering practice, to ensure the Committee's long term planning addressed this important issue.

Invaluable assistance was given on the day by Deni Greene, The Institution's consultant on "sustainability", Sydney Division President Elizabeth Taylor, Graham Brooks of Graham Brooks and Associates and Don Ellsmore, Heritage Manager State Rail.

The Committee especially appreciated the efforts of Mr John Petty and Mr Mark Taylor of Grant Thornton, who conducted the workshop.